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TO:MR. DAVID CROXTON
HW-106

JULY 25, 1994

FROM:ROBERT FARRELL

SUBJECT:PIER-91, BURLINGTON PROPERTY, FURTHER INVESTIGATIONS

LOWER AQUIFER

No further investigation is recommended for the deeper aquifer under the Burlington facility. This recommendation is based on the changing character of the contaminates that are detected in the lower aquifer in different sampling rounds, the results of the tidal analysis, and the directions of ground water flow that have been determined in the lower aquifer. The directions of ground water flow is to the south and the flow directions do not seem to be significantly effected by the changing tides. The contaminates that are detected in the lower aquifer are found in the monitoring wells that should be upgradient of the site (105B) or side-gradient of the site (122B). These wells suggest contaminates are entering the Burlington property from north of the property. The flow directions in the lower aquifer indicate that if there were a significant plume in the lower aquifer it would be detected by the existing wells in the lower aquifer (this should not to be taken to indicate there are enough wells in the lower aquifer to actually define the shape and limits of a plume if one plume existed).

The QA/QC on the ground water samples from the lower aquifer appears poor. It is suspected the contaminates detected in the lower aquifer wells are artifacts of sampling and/or laboratory errors. The different sampling rounds have detected different contaminates in the lower aquifer. In the first round done by Burlington TCE was detected in most lower aquifer wells. In the second round the contaminates had switched to TPH(diesel), carbon disulfate, and 1,1-DCA (all detected in the shallow aquifer samples). It is unlikely that the water quality of the lower aquifer is changing this rapidly. It is likely the TCE detected in the lower aquifer wells in the first round was laboratory error and the later contaminates detected in the second round were cross contaminates introduced because of sloppy sampling techniques.

The results from the tidal analysis indicated that wells 105B is in a lower conductance material than the other wells that responded to the tidal changes. Wells 122B and 106B did not respond at all to tidal changes even though they were closer to the shore than several other wells that did respond. This indicates that these two wells are in an area of the lower aquifer that is

different than all the other wells in the lower aquifer. Burlington's proposal to do a pump test on 122B would in all likelihood be unrepresentative of the majority of the lower aquifer under the facility.

For these reasons no additional investigations of the lower aquifer are recommended. The existing monitoring wells should continue to be sampled for water quality and water levels as a precautain against future break-through from the shallower aquifer.

SHALLOW AQUIFER

The shallower aquifier has a LNAPL phase floating on the water table and several dissolved organic contaminates in the ground water. The contaminate plumes for most the various organic chemicals migrated offsite to the west, southwest, and south of the Burlington facility. The plumes to the southwest have reached well 111 270 feet from the facility. The plumes leaving the southern end of the facility probably enter Lake Jacob. Many of the contaminate plumes in the ground water appear to be related to the LNAPL floating on the water table. The BTX contaminates are caused by this LNAPL release. The chloroethene has a plume of similar shape as the BTX plumes suggesting a relationship to the LNAPL release. The naphthalene, 2-methyl naphthalene, carbon disulfate, MEK, and acetone plumes appear to have no relationship to the LNAPL release. 1,1-DCA appears to have a plume different than the other organic contmainates extending as far north as well 113. The plume for TPH(diesel) appears to be in part coming from a release on site as well as entering site from the north and northeast. The highest levels of TPH(diesel) appear to come from a release within the marine diesel oil yard.

CORRECTIVE ACTION ON CONTAMINATES FROM THE BURLINGTON FACILITY

The interim corrective action proposed by Burlington in the June 15, 1994 proposal is to begin capturing the LNAPL plume present under the facility and extending offsite to the west of the facility. This system, as proposed, does not have the ability to significantly depress the water table to cause LNAPL to move toward the skimmer wells. As the interim system is now designed the wells will only remove the oil in the wells and will only depress the oil level within a few inches of each well. If there were a consistent direction of ground water flow, the flowline passing through each well would be captured. At this site the flow directions in the shallow aquifer is variable and at times reverse. The passive collectors on these skimmer will only collect the LNAPL immediately around it. In order to effectively in capture the LNAPL there has to be a slope to the water table that is imposed on the water table so that the LNAPL will flow to the skimmers. The corrective action for the LNAPL will have to create this sloping water table so that

LNAPLs under the buildings west of the facility are remediated.

The LNAPL skimmer system does nothing to remove the dissolved ground water contaminates. There needs to be a corrective action program in the shallow aquifer that will prevent further spreading of the plumes offsite to the west, south, and southwest. The only way to prevent further spreading of the plume is a pump and treat system. The following wells should be within the capture zone of the pumping system- 39-3, 107, 110, 10, 118, 119, 116, 117, 103a, 104a, and 113. Some contaminates have been detected at 111. It seems that the additional pumping necessary to bring well 111 within the capture zone will far exceed the relatively low level of contaminates present at this well. The plumes of contaminates extends under building W-39 and the capture zone for the Burlington facility should be designed to extend at least half way under this building.

A series of plume control wells located along the west side of the facility and seafood processing building and along the south side of the seafood processing building past well 10 would prevent further spreading of the plumes. Pumping wells internal to the facility, where the highest levels of contaminates are found (118, 119, 117, and 116), would speed the clean out. Rather than waiting for the contaminates to travel several hundred feet to the plume control wells at the edge of the facility these internal wells would shorten the travel times of the contaminates. These internal wells will also provide a point of reference for the progress of the clean up in the most contaminate part of the ground water. They will also provide a means for the additions and substraction of additives to the ground water that may be necessary as the clean up progresses. Air sparging and vapor extraction should be considered in the interior of the plume. The plume control wells will insure that the contaminates are not spreading while other activities are carried out within the plume to facilitate the timely clean up of the ground water.

To design a pump and treat system a certain amount of design investigation is necessary. Most important of these activities will be a pump test of sufficient duration and volume that a significant part of the upper aquifer is stressed. From the data obtained from one or more pump tests the number and pumping rates of the plume capture wells and the interior extraction wells can be estimated. The results of these tests and the corresponding estimations of the pump rates will be used to size the treatment facility.

A plan should be provided for conducting the pump and treat system investigation. This plan should incorporate a time schedule and necessary steps to achieve the permits necessary to conduct the testing, treat the water during the pump test, the sampling that will the done during the testing, and how the tests will be used in obtaining a final pump and treat system. Monitoring of any testing

will be critical in any design investigations. Every planned activity should include a detailed monitoring plan and a description or example of how the data obtained during the design investigations will the utilized.